

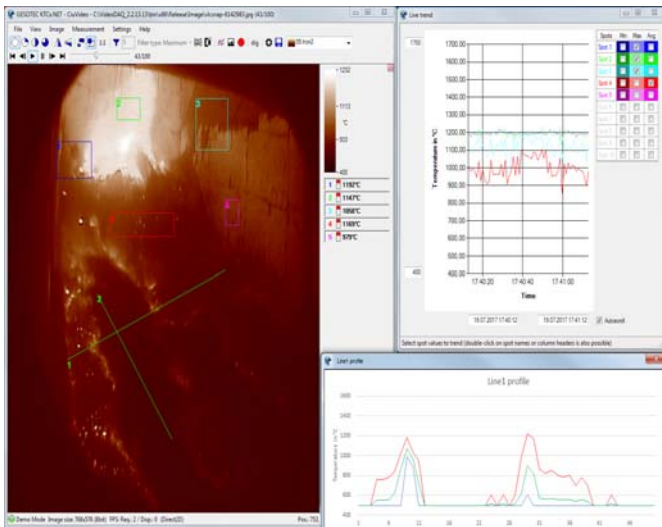
PyroViper™-3: The enhanced measuring multi-spectral industrial Imager System

PyroViper-3 furnace probe camera models “PV3x-xxxx” not only provide state-of-the-art infrared imaging for industrial high temperature process scenarios but also integrate “two-dimensional-pyrometry”. They thus deliver great visual details of the process conditions to the operator and at the same time accurately measure the temperature of virtually any object or region of interest within the system’s field of view. The rugged industrial solid-state imaging sensor, ranging from NIR to LWIR adapting to the process requirements, has the advantage of no “moving system parts”.

PyroViper-3 sensor modules are mounted to the “process wall” together via an air-cooled wall-box. Gesotec’s unique air purging and cooling system makes water cooling obsolete (optional water cooling is available if required). A heat resistant housing and an automatic retracting device ensure safe operation. All PyroViper lens & sensor assemblies can be air-purged and cooled by just one single air supply line. The heavy-duty furnace lens is available with usable lengths between 202mm and 1142mm, thus covering even the most demanding installation conditions.

Both the image and the temperature information of the process are “observed” via wide angle optics of advanced design and transferred by a special relay lens system to the high-tech, remote controlled sensor module.

The image, temperature and system status signals are transmitted via coaxial, CAT6 or fiber optic cable (up to 2km) to the smart **Data-Acquisition-Controller “xDAC-2”** that usually is located in the process control room or nearby. This unit includes the software package VDAQ.xNET, which processes video and temperature information of an object in real time.



The PyroViper design features the following advantages:

- **Real-time image** through **computer-optimized probe optics**:
 - Excellent image **quality**.
 - Online **temperature measurement** anywhere in the scenario
 - **Reduced maintenance** cycles and efforts (basically maintenance-free)
 - **No special expertise** for handling, cleaning, troubleshooting
 - Design protects delicate electronics even when disassembled
 - High precision mechanics with clever design for ease of use
 - Fine adjustments to optimize optical and mechanical properties
 - **Fully adjustable optical system** with simple user interfaces
 - Optical **zoom**, **external focus**, **centering** of optical axis...
 - Most of them can be even adjusted in operation!
- **Lightweight**, easy to dismount and transport. No high shipping costs when a repair is required
 - **Separate air-intake for optic and electronics** to minimize air consumption, maintenance and wear of the unit.
 - **Exchangeable probe optics**
 - **Detection range adapted to the application** (see through dust, flame...), **from NIR to LWIR** with custom wavelength bands.

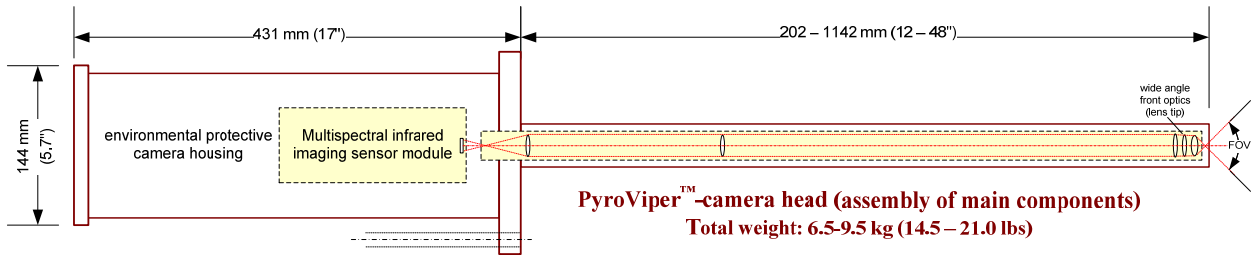
Furthermore, the flexible PyroViper design includes enhanced and customizable sensor features: additional sensors (pressure, temperature, humidity, vibration ...) can be built into the housing to fit your needs.

On-line support of our engineer team via telephone and email free of charge for the whole product lifetime!

Advantages of PyroViper™-3 against conventional High Temperature CCTV-Systems	Industrial Process
Continuous- & detailed observation of combustion conditions in the burning zone by “Infrared-TV”. Accurate measurement of product-, and/or refractory-, and/or combustion/flame- temperatures (option).	Cement- & lime- production. Waste burning.
Monitoring of the clinker fall, the clinker- flow along the grates, & the clinker temperature distribution. Detection of “red rivers” and “snow-men”. Control of the blower efficiency and clinker bed depth.	Cement clinker coolers.
Quantitative observation & control of heating uniformity, product quality, and combustion. Control of smelt bed size & shape. Improved boiler performance, reduced pollution, optimized fuel consumption.	Reheat furnaces and recovery boilers

A typical PyroViper™-3 system configuration consists of the following basic components

Enhanced multi-spectral camera with two calibrated-, high precision-, solid-state area sensors for visual- and/or thermal- imaging.
Air-cooled industrial sensor housing with “quick change connectors” & slide track mounting interface for easy full lens retraction.
“Jet-stream” air-cooled & -purged stainless steel furnace probe optics with a “bright image lens tip” incl. a sapphire entrance window.
Air-cooled furnace wall box incl. auto-shutter & unique ball-head mounting via a heat resistant stainless-steel lens protection pipe.
Smart data acquisition controller & display unit with UXGA+SVideo monitor signal output & GigE TCP/IP Ethernet-LAN.



PyroViper™- temperature measuring industrial furnace probe camera sensor

Sensor types:	Digital high performance industrial solid state FPAs (analog optionally) from 0.4 to 14.0µm
Sensor DUAL video signal output:	Digital modules: Ethernet IP-Video, CameraLink, USB, Gigabit Ethernet (“GigE”). Analog options: (1V p-p, 75 Ohms): PAL/NTSC, RS-170/CCIR.
Sensor “imaging resolution”:	Digital modules: from 320 x 240 up to 1920 x 1200 effective pixels. Analog options: NTSC/PAL signal with up to 640H x 460V “imaging pixels”.
Sensor frame/field rate:	Digital modules: between 5Hz and 100Hz (depending on sensor type & resolution). Analog options: 25/50Hz (PAL/CCIR), 30/60Hz (NTSC/RS-170).
Sensor SNR (signal to noise ratio):	Depending on model: 50-73 dB
Typical calibrated temperature ranges: (available customized ranges from 100°C)	R1- Cement Kiln: 800-1800°C, R2 – Cement Cooler: 600-1400°C, R3-Smelt Bed: 800-1200°C, R4- Lime Kiln: 600-1600°C, R3-Superheaters: 200-800°C, Rx: Custom
Typical spectral filters:	F1x - NIR Filter: NBP/LP range 0.6µm to 1.2µm (Cement, Lime Kiln) F2x - SWIR Filter: NBP at 1.3µm/1.7µm/2.3µm/2.6µm (Lime Kiln, Boiler) F3x - MWIR Filter: NBP at 3.4µm/3.9µm/4.2µm, LP at 4.5µm (Cement, Lime Kiln, Boiler) F4x - LWIR Filter: BP/NBP between 8.5µm and 12.5µm (Lime Kiln, Boiler) Fx – Custom - Optical filters optimized for the application (e.g. see through dust/vapor)
Measurement accuracy, repeatability:	<±1.0% (full scale), <±0.5% (full scale).
Typical temperature resolution / NETD:	<5°C / 2,5°C @ 1000°C
Typical Spot size 90/50% SRF (FOV=90°D):	Infrared FPA imaging sensor with 320x240 pixel: <10/<5mrad Infrared FPA imaging sensor with 640x480 pixel: <5/<2mrad CCD/CMOS HD sensors: <3/<1mrad.
Multiple spot measurement cycle:	<40 ms (continuous measurement) or actual frame rate on over 50 configurable AOIs
Power requirements:	12VDC or 24VDC +/-10% max. 15.0W.

PyroViper™- high temperature furnace probe lens assembly (standard furnace probe lens models)

Overall length	273mm, 451mm, 629mm, 921mm, 1213 mm (12”, 18”, 24”, 36”, 48”).
Usable length / Shroud diameter:	202mm, 380mm, 558mm, 850mm, 1142 mm (8”, 15”, 22”, 34”, 45”) / 42.4 mm (1.67”).
Shroud diameter:	41.3mm (1.625”) or 60.0mm (2.362”)
Field of view (FOV):	Typical 72°H x 54°V x 90°D (custom FOVs between 45°D & 110°D are available).
Angle of view (AOV):	Standard AOV is “straight ahead”. Optional: “right AOV” or “obtuse AOV”.
Environment: (lens view-port in furnace wall)	Continuous lens operating temperature is up to 1800°C (3272°F) if protected with an additional, open-cycle air cooled wall box shroud made of stainless steel or ceramics. Option: Additional closed-cycle water cooled shroud made of stainless steel.
Lens air purging & cooling:	Instrument-quality air: 34-72Nm ³ /h at 0.1-0.7MPa Water cooling option: 5-15 liters per minute at dT≤50°C.
Optional Wall box shroud cooling:	Pre-filtered ambient air: 12-24Nm ³ /h at 0.02-0.1MPa

PyroViper™- environmental protective camera housing (sensor module enclosure)

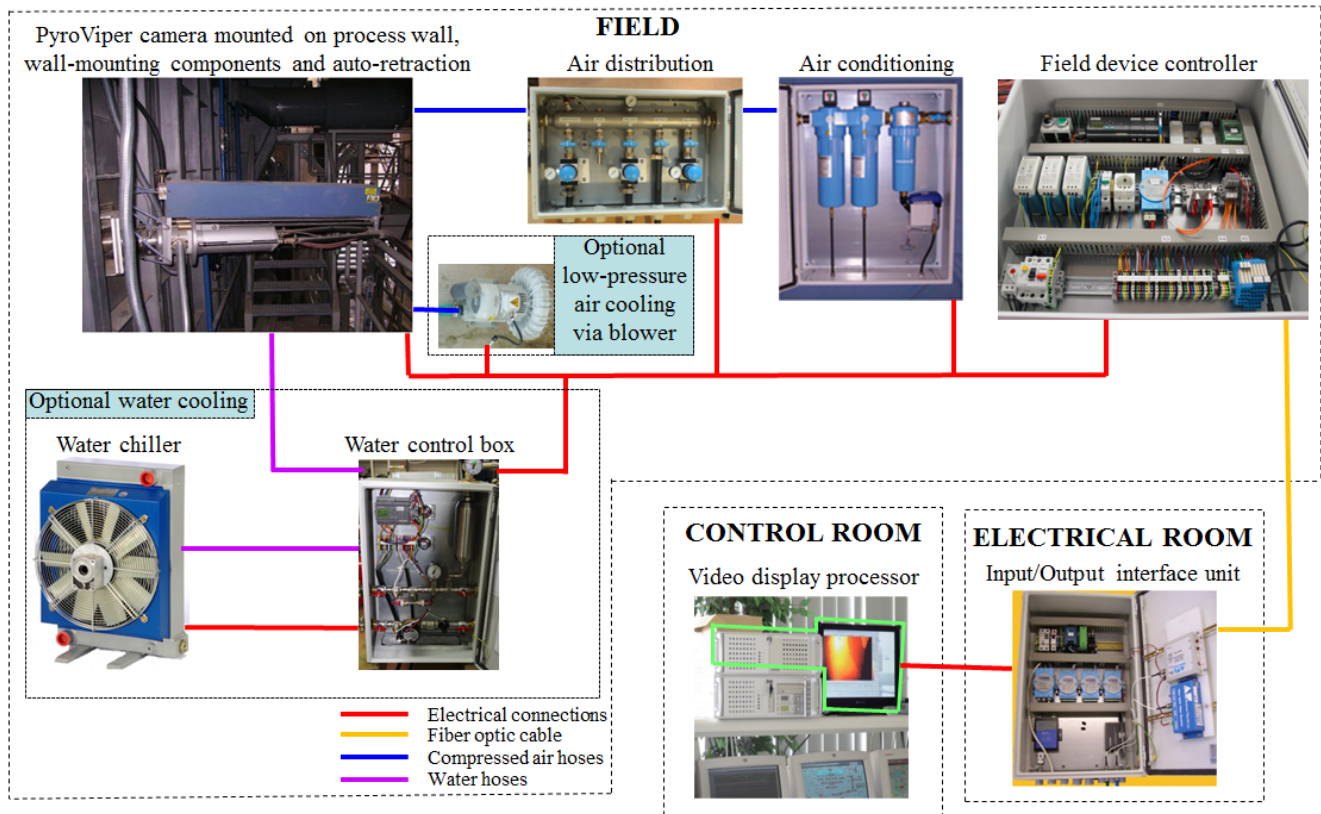
Material:	High temperature synthetic and/or stainless steel/aluminum.
Environment with standard air cooling:	Furnace surrounding ambient air temperature up to 80°C Option: Vortex cooler for ambient air up to 150°C or pressure air temperature up to 70°C. Outer furnace wall temperature up to 500°C with air cooled wall box shroud.
Sensor air purging & cooling:	Instrument-quality air: 3.4-7.2Nm ³ /h at 0.01-0.07MPa Requirement: maximum pressure air temperature 40°C, else vortex cooler required
Environmental protection rating:	IP66; Vibration IEC68-2-6 (5-150 Hz, 2g, 3 direction); Humidity ≤99% RH @40°C

PyroViper™- accessories and options

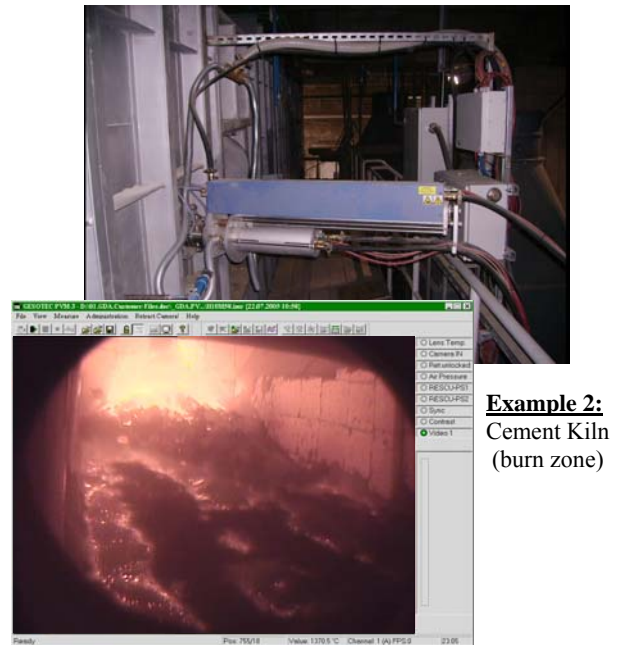
Customized optics/filters & digital CCD/CMOS/infrared FPA imaging sensors adapted to the application for optimized image quality.
High performance air filtration/distribution system, automatic retract assembly with emergency air reservoir, automatic port de-slagger.
Heavy-duty furnace wall-box with auto-shutter & air-cooled lens protection shroud, water cooled welding socket, ball-head mount, etc.
REtract- and Sensor Control Unit “RESC-U” : Sensor power supply, automatic retraction control, video & control signal conditioning.
Signal processor I/O unit : signal conditioning, status & alarm I/O (dry contacts/4-20mA), interface to process control systems (PCS).

GESOTEC® Sophisticated Infrared- and Video- Signal Processing

Schematics of a typical PyroViper Furnace Probe Camera System for Kiln/Cooler Process Monitoring



-Subsystem of KTCx.NET Kiln&Cooler concept:
integrated thermal and visual process monitoring



GESOTEC® Europe
www.gesotec.de
info@gesotec.de

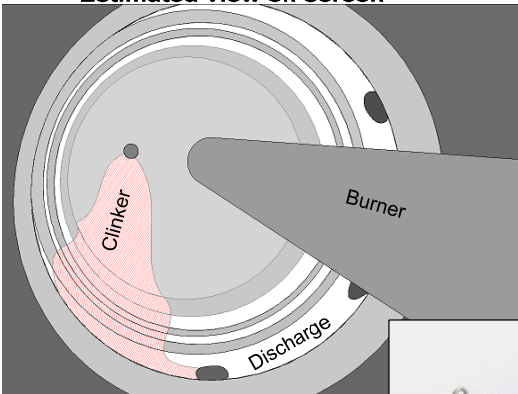
GESOTEC®
Imaging Pyrometry
Industrial Thermography
Process-Monitoring & Control
Infrared- & Video- Signal Processing

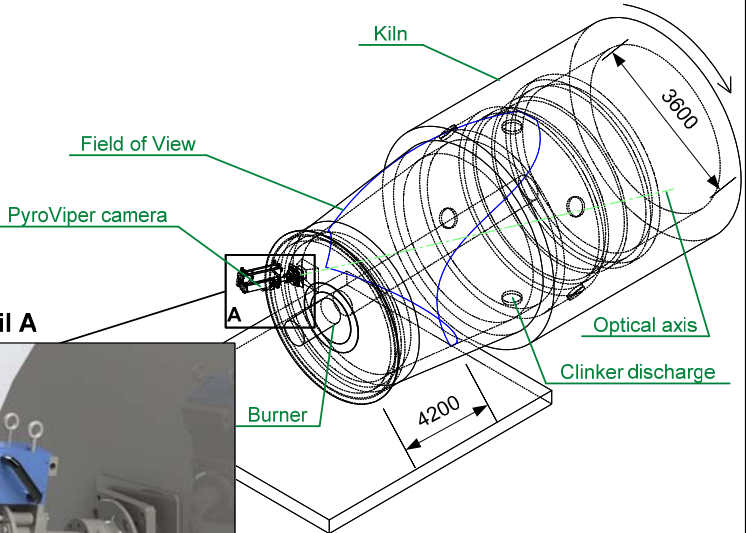
GESOTEC® USA
www.gesotec.com
info@gesotec.com

PyroViper™ application note: cement kiln

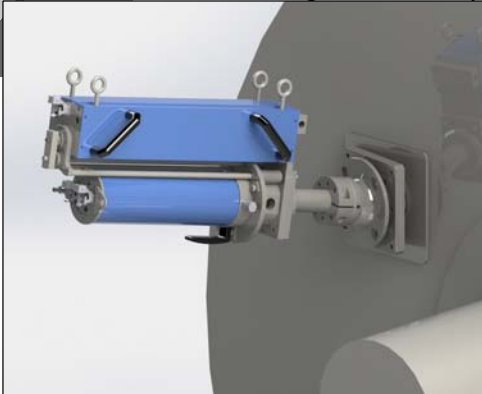
Project engineering

Estimated view on screen



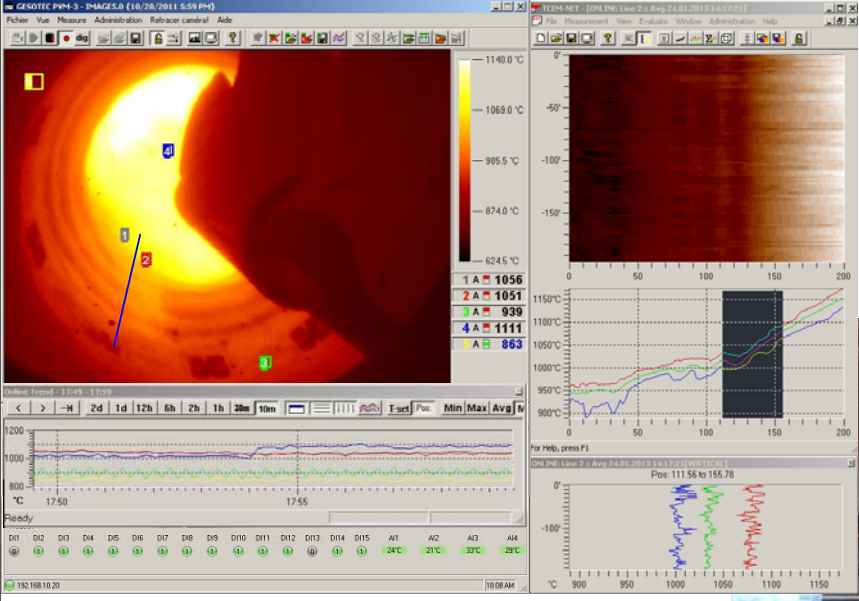


Detail A



- Optimization of kiln interior surveillance
- Consideration of particular kiln construction
- Assessment of best possible mounting position
- Determination of customized field of view
- Design of tailored mounting solution

Actual implementation



picture on screen

Installation on kiln hood wall

